Study on Some Chemical Compositions and Antioxidant Activity of *Carica Papaya* L. (Thin – Baw) Leaf From Hinthada Township In Ayeyarwady Region

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Abstract

In the present study, the selected *Carica papaya* L. (Thin-baw) leaf is used in household remedy for digestion, nutrient and prevention of cancer. It is very well-known in natural antioxidant additive. The aim of the study is to examine some chemical compositions and to investigate antioxidant of *Carica papaya* (Thin-baw) leaf. The preliminary phytochemical tests revealed the absence of cyanogenic glycosides assessed by test tube method. The leaf sample revealed petroleum ether-soluble matter (5.90 %), alcohol-soluble matter (11.70 %) and water-soluble matter (19.12 %) by A.O.A.C method. In addition, the nutritional values such as moisture content (6.19 %), ash content (11.64 %), protein content (26.79 %), fibre content (10.34 %), fat content (7.94 %), carbohydrate (37.10 %) and energy value (328 kcal/100g) were also performed by A.O.A.C method. Using direct-extraction method, petroleum ether, ethyl acetate, 96 % ethanol and water extracts were prepared besides tested antioxidant properties by DPPH assay method in conjunction with TLC. It was viewed that ethyl acetate extract, 96 % ethanol extract and water extract were pronounced antioxidant than that of petroleum ether extract. Thus, the current study can contribute to the local indigenous communities in our country.

Key words: *Carica papaya*, Thin-baw leaf, chemical compositions, antioxidant

Introduction

The whole plant of *Carica papaya* L. (papaya) is very popular because of its precious medicinal properties, manufacture of additive food and other industrial applications. Some flavonoids and related compounds isolated from various parts of papaya show bioactivities such as antibacterial activity, antioxidant activity and anti-inflammatory activity (Godson, *et al*., 2012). So, it was chosen to study on some chemical compositions especially in nutritional values and how to show antioxidant activity on various extracts of papaya leaf. That is effective in the prevention and treatment of stomach cancer, lung cancer, pancreatic cancer, colon cancer, leukemia or other blood cancer, dengue fever, heart disease and nausea (Krool, 2001).

Botanical Aspects of *Carica papaya* L.

Name : Thin - baw (in Myanmar),
Papaya (in English)
Botanical Name : *Carica papaya* L.
Family : Caricaceae
Genus : *Carica*
Species : *papaya*
Leaf : Large, 50 -70 cm in diameter, seven lobes (Kress, *et al*., 2003)

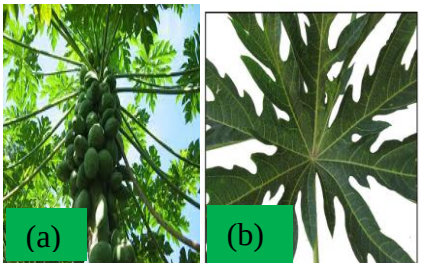

Figure1. (a) Plant of *C. papaya* L.
(b) Leaf of *C. papaya* L.

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Distribution and Chemical Constituents

It is originally derived from the southern part of Mexico and presently distributed over the whole tropical area (Kirtikar and Basil, 1975). Papaya plant described in Figure 1(a) is widely grown in Myanmar for its medicinal properties besides food products. Papaya leaf shown in figure 1 (b) consists of minerals (Ca, K, Mg, Zn, Mn, Fe), alkaloids (carpinine, carpaine), vitamins (Vitamin C, Vitamin E) and flavonoids (Myrcetin, Kaemfrol) (Aravind, *et al*., 2013).

Materials and Methods

Plant Materials

The papaya leaf or *C. papaya* (Thin-baw) leaf was collected from Hinthada Township, Ayeyarwaddy Region. The plant was identified at Department of Botany, Hinthada University. The leaf sample was washed, cleaned and dried at room temperature for three weeks. Then, the dried sample was powdered and stored in air-tight container.

Preliminary Phytochemical Tests of *C. papaya* Leaf by Using Test Tube Method

Preliminary phytochemical investigation was carried out on powdered, dried sample of *C. papaya* leaf.

Some Chemical Analysis of *C. papaya* Leaf

Investigation of soluble matter of *C. papaya* leaf

The leaf sample was investigated soluble matter content in non-polar and polar solvent such as petroleum ether, alcohol and water by A.O.A.C method (A.O.A.C, 1990).

Determination of some nutritional values of *C. papaya* leaf

Some nutritional values such as moisture, ash, crude protein, crude fibre, crude fat, carbohydrate and energy value of *C. papaya* leaf were determined by using A.O.A.C method at Myanmar Food Processors and Exporters Association (MFPEA), Yangon.

Preparation of Extraction from *C. papaya* Leaf

The air-dried powder (50 g) was individually cold extracted with (500 mL) of solvents; petroleum ether (60-80 °C), ethyl acetate and 96 % ethanol in separate conical flasks, respectively for at least three weeks and then filtered. Water extract of leaf sample was prepared by boiling with distilled water for 6 hours and filtered. The filtrates evaporated by using sand bath and the dried extracts were calculated their yield % through weighing. The four crude extracts from the leaf sample were applied for investigation of antioxidant properties by DPPH assay method in conjunction with TLC.

Antioxidant Activity of Various Extracts from *C. papaya* Leaf by DPPH Assay Method in Conjunction with TLC

The obtained four crude extracts of *C. papaya* leaf were also determined antioxidant activity by using DPPH assay method in conjunction with thin layer chromatography. Silica GF_{254} precoated plate and various ratio of solvent system (petroleum ether-ethyl acetate) were employed. After developing the chromatograms, these were viewed under UV lamp of 256 and 366 nm and UV active spots that were marked with pencil. To determine antioxidant activity, the spots were sprayed with DPPH solution whether or not quenching was observed. If the UV active spots on thin layer chromatogram decolorize the DPPH violet colour, the spots will reveal the antioxidant activity.

Results and Discussion

Preliminary Phytochemical Examination of *C. Papaya* Leaf

Phytochemical screening serves as an initial step to recover new sources of phytochemical specially to know biologically active compounds. For this reason, the phytochemical test was carried out on *C. papaya* leaf and it was found that *C. papaya* leaf consists of alkaloids, α-amino acids, carbohydrates, flavonoids, glycosides, organic acids, phenolic compounds, reducing sugar, saponins, starch, steroids, tannins and terpenoids. However, cyanogenic glycosides, poisonous compounds were not found in it.

Some Chemical Analysis of *C. Papaya* Leaf

Investigation of soluble matter of *C. papaya* leaf

To separate the polar and non-polar organic constituents present in the sample, petroleum ether, ethanol and water-soluble matter contents were determined by A.O.A.C method. The leaf sample revealed petroleum ether-soluble matter (5.90 %), alcohol-soluble matter (11.70 %) and water-soluble matter (19.12 %). It was found that amount of polar constituents presents in *C. Papaya* L. leaf was higher than that of non-polar constituents.

Determination of some nutritional values of *C. papaya* leaf

It was found that the content of moisture (6.19 %), ash (11.64 %), crude protein (26.79 %), crude fiber (10.34 %), crude fat (7.94 %), carbohydrate (37.10 %) and energy value (328 kcal/100 g) obtained in dried *C. papaya* leaf. The histogram of related results was shown in Figure 2. The moisture content of *C. papaya* leaf was found to be low and it was assigned that sample has a moderately composition of water and can avoid the destruction of sample due to contaminations such as bacteria, mould, etc. during sample preparation. Ash is the inorganic residue remained after the organic matter has been burnt away. Ash content may be determined by heating the sample in a porcelain crucible to 600 °C. It could be remarked that less amount of inorganic materials contained in this sample than that of organic materials. The protein content of *C. papaya* leaf indicates that it is large nutritive value from food chemistry. Proteins are needed to build and maintain muscle, blood, skin, bones, tissues and organs of the human body. Due to the result of fiber content, *C. papaya* leaf revealed that it is fibrous. Fiber slows the rate that sugar is absorbed into the

bloodstream. Fiber can also solve constipation problem in gut. It was found that fat content was low, so it may be used as anti-obesity. In addition, it was observed that energy value was very high. So, it could be assigned that *C. papaya* leaf was very nutritive in food industry.

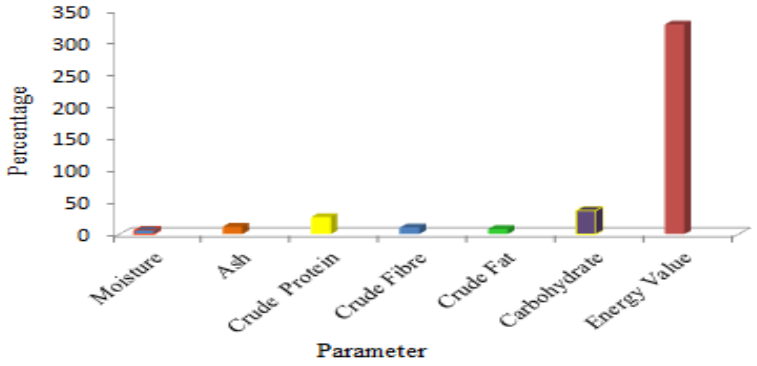

Figure 2. Histogram of some nutritional values in *C. papaya* (Thin-baw) leaf

Preparation of Extraction from *C. Papaya* Leaf

Extraction of *C. papaya* leaf was carried out by various solvents with their respective polarity. In this work, petroleum ether extract (4.26 %), ethyl acetate extract (7.60 %), 96 % ethanol extract (10.30 %) and water extract (15.12 %) were obtained. It was assumed that relatively non-polar constituents might contain in petroleum ether extract, and in ethyl acetate extract, moderately polar compounds whereas in ethanol extract, polar compounds and in water extract, more polar components may involve. These obtained extracts were used to test antioxidant activity of the selected medicinal plant.

Antioxidant Activity of *C. Papaya* Leaf

The obtained four crude extracts were also determined antioxidant activity by using DPPH assay method in conjunction with thin layer chromatography. It is simple, cost effective and very easy method to record antioxidant activity of plant materials. In this method, silica GF_{254} precoated plate and varieties of solvent systems were employed.

The developed thin layer chromatography (TLC) of petroleum ether (PE) extract with the solvent system, petroleum ether-ethyl acetate (3:1) v/v was examined antioxidant activity. When the spots were sprayed with DPPH solution a few quenching spot with DPPH was observed. It was noted that some compounds containing in the petroleum ether extract showed small amount of antioxidant activity. The chromatogram of PE extract with DPPH solution was shown in Figure 3 (a). After developing chromatogram of ethyl acetate (EtOAc) extract with petroleum ether-ethyl acetate (3:1) v/v, this TLC was also examined antioxidant activity. It was found that the spots on TLC quenches with DPPH violet solution. Therefore, the compounds containing in the ethyl acetate extract exhibited potent antioxidant activity because of the polyphenolic nature of the flavonoid and related compounds. The chromatogram of EtOAc extract with DPPH solution was shown in Figure 3 (b).

Ethyl alcohol (EtOH) extract was examined antioxidant activity by employing TLC and solvent system using petroleum ether-ethyl acetate (1:1) v/v. It was found that the spots on thin layer chromatogram quenches with DPPH violet solution. Therefore, the compounds containing in the ethyl alcohol extract exhibited

antioxidant activity because of the polyphenolic nature of the flavonoid and related compounds. The chromatogram of EtOH extract with DPPH solution was shown in Figure 3 (c). Similarly, the obtained water extract was examined antioxidant activity by developing TLC with the use of solvent system, petroleum ether- ethyl acetate (1:1) v/v. It was found that the tailing yellow spots on thin layer chromatogram quenches with DPPH violet solution. Therefore, the compounds containing in the water extract exhibited antioxidant activity. However, the chromatogram did not show the clear spots of TLC feature. The chromatogram of water extract with DPPH solution was shown in Figure 3 (d).

Finally, from the observations of above mentioned experiments, it was concluded that the ethyl acetate extract shows clear thin layer chromatographic spots and contains polyphenolic compounds and related flavonoid compounds possessing antioxidant activity.

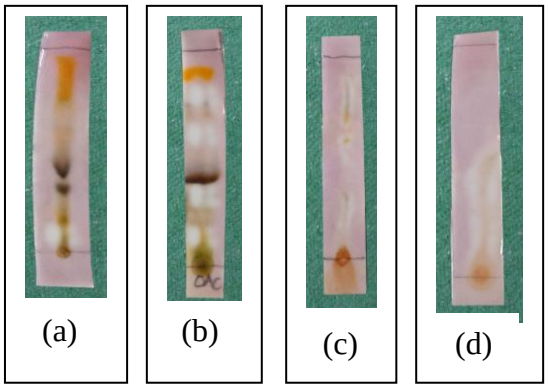

Figure 3. (a) Chromatogram of PE extract with DPPH solution
(b) Chromatogram of EtOAc extract with DPPH solution
(c) Chromatogram of EtOH extract with DPPH solution
(d) Chromatogram of water extract with DPPH solution

Conclusion

The preliminary phytochemical tests on *C. papaya* leaf revealed the presence of alkaloids, α-amino acids, carbohydrates, flavonoids, glycosides, organic acids, phenolic compounds, reducing sugar, saponins, starch, steroids, tannins and terpenoids but the absence of plant toxin namely cyanogenic glycosides in the sample. According to the obtained results of nutritional values, it was denoted that *C. papaya* leaf can be utilized as a good food source of minerals, protein, healthy fibre and energy. Crude extracts were prepared from *C. papaya* (Thin-baw) leaf using petroleum ether, ethyl acetate, 96 % ethanol and water as their solvent polarity. The antioxidant activity of crude extracts was studied by DPPH assay method in conjunction with thin layer chromatography. It was indicated that petroleum ether extract showed slightly less antioxidant activity whereas ethyl acetate extract, ethanol extract, water extract exhibited greater antioxidant activity. Based on the finding of present study, it is concluded that Thin-baw leaf possess polyphenolic compounds and related flavonoid contents and significant antioxidant properties. In fact, the selected Myanmar medicinal plant, (Thin-baw) leaf may be used as "natural antioxidant additives" in both therapeutic and food industry in place of "synthetic antioxidant additives". This research could be expected that it can contribute to the public health with the local indigenous medicine against various cancers by using natural antioxidant supplements. The result of this study is an encouragement for further work that will lead to the isolation and elucidation of the structure of the active component.

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